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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/591,867	06/12/2000	Tinku Acharya	042390.P8746	4736

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EXAMINER

TRAN, NHAN T

ART UNIT

PAPER NUMBER

2615

DATE MAILED: 01/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/591,867

Applicant(s)

ACHARYA ET AL.

Examiner

Nhan T. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7,9 and 11-20 is/are rejected.
- 7) ☒ Claim(s) 8 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see amendment, filed 8/2/2004, with respect to the rejections of claims 1-6, 11-20 under 35 USC 103(a) have been fully considered and are persuasive.

Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of Bishay et al (6,507,364) and Bulman (US 6,351,265).

Drawings

2. The drawings were received on 8/2/2004. These drawings are Figures 3 & 4.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-7, 9, 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishay et al (US 6,507,364) in view of Bulman (US 6,351,265).

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Regarding claim 1, Bishay discloses a method of using hue to interpolate color pixel signal values comprising:

for a particular pixel location in a subsampled image, comparing relative changes in intensity for two mutually orthogonal directions across said particular pixel location (X); and computing a color signal value (missing color value) for that particular pixel location for a color plane other than the color plane of the pixel signal value in the subsampled color image at that location, the computation including relatively weighing the relative changes in hue (hue-weighted values of neighboring pixels belonging to detected edge direction), the relative weights depending, at least in part, on the difference in intensity value in one particular direction relative to the other. See Figs. 2-7; col. 2, lines 45-56; col. 4, lines 40-54 and col. 5, line 9 – col. 6, line 4.

Bishay does not teach comparing relative changes in hue and the relative weights depending, at least in part, on the difference in hue in one particular direction relative to the other. Instead, Bishay teaches using relative changes in intensity values (brightness) of neighboring pixels to detect an edge and to compute missing color values using hue-weighted technique for a directional interpolation. However, it is obvious that characteristic of an object in an image can be determined based on hue, brightness, **gradient of hue or brightness**, etc...as suggested by Bulman in col. 15, lines 30-34.

Therefore, it would have been obvious to one of ordinary skill in the art to configure the imaging system in Bishay to compare relative changes in hue for detection of characteristic of an edge and that the missing color values obtained as hue-weighted values of neighboring pixels

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would be based on the difference in hue value in one particular direction relative to the other as an obvious variant over the difference in intensity (brightness) of pixels.

Regarding claim 2, the combination of Bishay and Bulman would teach computing a color signal that includes relatively weighing the differences in hue by relatively weighing more heavily the difference in hue associated with the direction having a difference in hue less relatively for the particular pixel location (see Bishay, col. 6, lines 45-63 for the interpolation with heavily weighted in hue in the direction where the particular pixel X belongs to). It should be noted that hue-weighted in other directions are zero.

Regarding claim 3, it is clearly seen in Bishay that the subsampled image comprises an image in RGB color space format including an R plane, a G plane and a B plane (Bishay; col. 4, lines 47-54 and col. 6, lines 45-63).

Regarding claim 4, Bishay discloses a CFA pattern that can be different pattern layouts that encompasses a Bayer pattern. See Bishay in col. 4, lines 31-35.

Regarding claims 5 & 6, it is also clear that the color plane of the pixel signal value at the particular pixel location comprises either R color plane, G color plane or B color plane (see Fig. 2 in Bishay, col. 4, lines 40-54 and note that location X is an example of Blue color plane, other Red and Green planes are also considered in the same manner) and that the two mutually orthogonal directions comprising the horizontal and vertical directions (Bishay, Figs. 2-6 and

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col. 5, lines 9-45); the particular color plane for the color signal value being computed comprising the G plane (as an example described in col. 5, lines 9-45, X is an G pixel and being computed for missing R and B color values).

Regarding claim 7, it is submitted that missing R color value at B pixel location is also performed in the same manner as described in the **exemplary** method for missing color values at G pixel location as described in col. 5, line 9 – col. 6, line 4 and col. 6, lines 30-63, wherein a main diagonal (i.e., positive 45 degrees) and a secondary diagonal (i.e., negative 45 degrees) directions are used for the interpolation process.

Regarding claim 9, see the analysis of claim 7, wherein missing B color value at R pixel location is performed in the same manner as described.

Regarding claims 11 & 12, see the analysis of claims 5 & 6, wherein missing G color value at either B or R pixel location is also performed in the same manner as described.

Regarding claim 13, see the analysis of claim 1. Furthermore, Bishay teaches that the principle of the interpolation method as disclosed may be implemented in a computer program stored in the imaging device 10 (Bishay, col. 7, lines 60-64).

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Regarding claim 14, it is clear that the instructions to be executed for interpolating color pixel signal values from a subsampled image in RGB color space format (see Fig. 7 for an algorithm of the interpolation process).

Regarding claim 15, see the analysis of claims 4 & 14.

Regarding claim 16, see the analysis of claim 1 and Fig. 1, col. 7, line 60 – col. 8, line 5 for an electronic circuitry adapted to process and interpolate pixel signal values.

Regarding claim 17, see the analysis of claims 3, 14 & 16.

Regarding claim 18, see the analysis of claim 4 & 14.

Regarding claim 19, see the analysis of claim 1 and Fig. 1, col. 7, line 60 – col. 8, line 5 for a computing platform adapted to process and interpolate pixel signal values.

Regarding claim 20, see the analysis of claim 3, 14 & 16.

Allowable Subject Matter

4. Claims 8 & 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach or fairly suggest the limitations required in each of claims 8 & 10 taken in combination with their corresponding independent claims and intervening claims.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhan T. Tran whose telephone number is (703) 605-4246. The examiner can normally be reached on Monday - Thursday, 8:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew B Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NT.

A handwritten signature in black ink, appearing to read 'Andrew Christensen', with a long horizontal flourish extending to the right.

ANDREW CHRISTENSEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600